

## LA-UR-21-24005

Approved for public release; distribution is unlimited.

Title: MANHATTAN

Author(s): Carr, Alan Brady

Intended for: Historical talk of general interest

Issued: 2021-04-26

---

**Disclaimer:**

Los Alamos National Laboratory, an affirmative action/equal opportunity employer, is operated by Triad National Security, LLC for the National Nuclear Security Administration of U.S. Department of Energy under contract 89233218CNA000001. By approving this article, the publisher recognizes that the U.S. Government retains nonexclusive, royalty-free license to publish or reproduce the published form of this contribution, or to allow others to do so, for U.S. Government purposes. Los Alamos National Laboratory requests that the publisher identify this article as work performed under the auspices of the U.S. Department of Energy. Los Alamos National Laboratory strongly supports academic freedom and a researcher's right to publish; as an institution, however, the Laboratory does not endorse the viewpoint of a publication or guarantee its technical correctness.

LOS ALAMOS  
PROJECT  
MAIN GATE  
PASSES MUST BE  
PRESENTED TO  
GUARDS

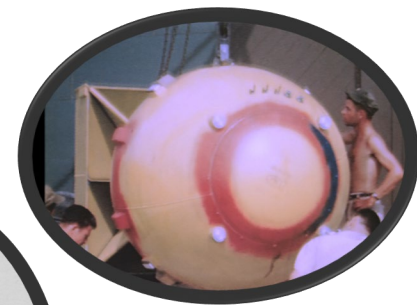
# NATIONAL SECURITY RESEARCH CENTER



# MANHATTAN

The View from Los Alamos of History's Most Secret Project

NATIONAL SECURITY  
 **RESEARCH  
CENTER**



**Alan B. Carr**  
NSRC Senior Historian  
Program Manager

# Hitler and Stalin Start World War II



- Hitler and Stalin secretly divided Poland in August 1939
- Germany invaded Poland on September 1
- The Soviet Union invaded Poland on September 17
- Britain and France declared war on Germany, but maintained neutrality with the Soviets (*they did prepare war plans!*)
- In November Stalin invaded Finland
- The Soviet Union annexed Bessarabia, Northern Bukovina and the Hertza region of Romania in June 1940
- Latvia, Lithuania and Estonia were forcefully annexed into the Soviet Union in August 1940





# German Aggression, 1940-41



- Germany invaded Denmark and Norway in April 1940
- The following month, the Germans attacked Holland, Belgium, Luxembourg and France
- Italy declared war on Britain and France on June 10
- The Battle of Britain began in early August and ended in October
- In the spring of 1941 the Germans invaded the Balkans
- The Germans attacked the Soviet Union on June 22, 1941
- By late 1941 the German advance was finally halted at the gates of Moscow

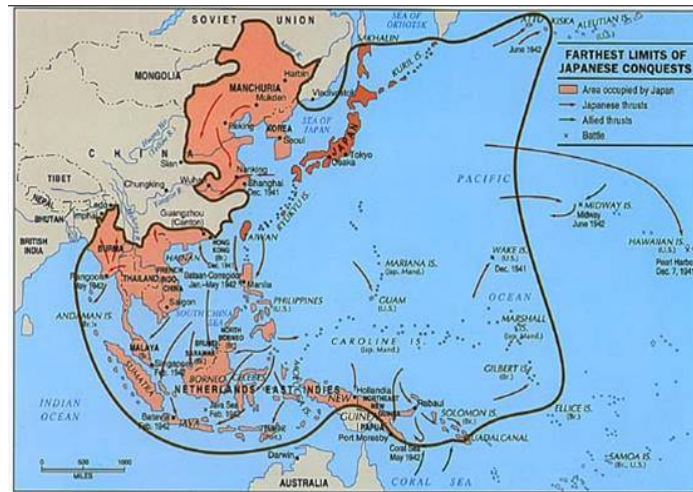


# War Breaks-Out in the Pacific

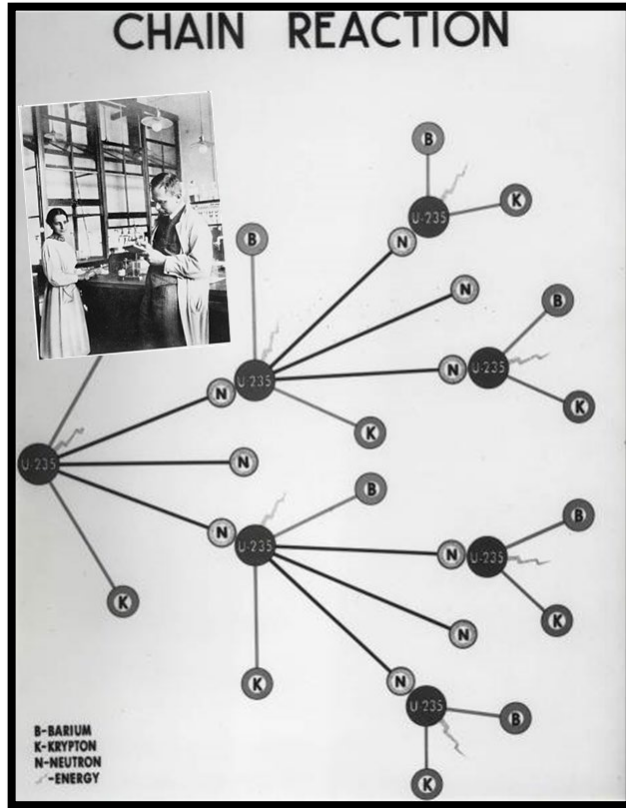


- On December 7, 1941 the Japanese attacked the United States Pacific Fleet at Pearl Harbor
- The United States and Britain immediately declared war on Japan
- Japan invaded the Philippines on December 8
- On December 11 Germany and Italy declared war on the United States
- “We won a great tactical victory at Pearl Harbor and thereby lost the war.”

Admiral Hara Tadaichi



# The Discovery of Fission



- In Germany, in late 1938, Fritz Strassmann and Otto Hahn produced barium by bombarding uranium with neutrons
- Lise Meitner and Otto Frisch identified this process as nuclear fission in very early 1939
- Fission: The splitting of an atomic nucleus resulting in the release of large amounts of energy
- Scientists immediately realized the potential for an atomic bomb



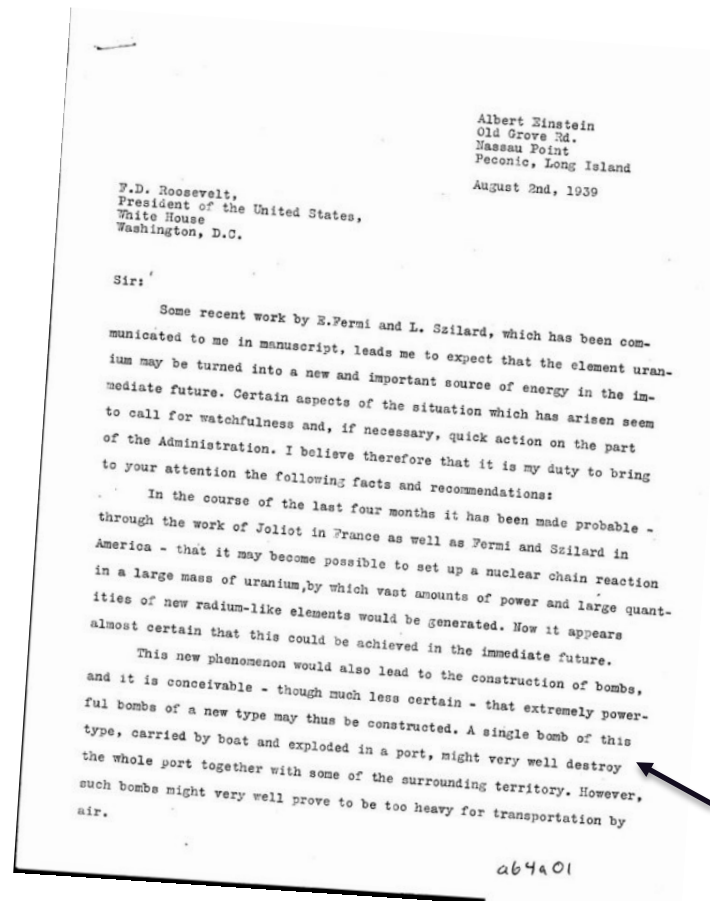
# The Birth of the American Project(?)



- A month before Germany invaded Poland Albert Einstein (*and Leo Szilard!*) warned President Roosevelt of fission's potential
- In October 1939 Roosevelt responded by establishing the Uranium Advisory Committee
- In the summer of 1940 it was absorbed by the National Defense Research Committee (NDRC)
- The American Project was focused on building a reactor: not a bomb



Halifax, 1917



# From Reactors to Bombs



- The British MAUD report of July 1941 predicted material for an atomic bomb could be available by late 1943
- In late fall 1941 the NDRC chairman was given a copy of the report
- The attack on Pearl Harbor both helped and hurt the program
- The Manhattan Engineer District was finally established in August 1942
- Colonel Leslie R. “Dick” Groves was selected to lead the project in September and promoted to brigadier general





LOS ALAMOS  
PROJECT  
MAIN GATE  
PASSES MUST BE  
PRESENTED TO  
GUARDS

# A National Project

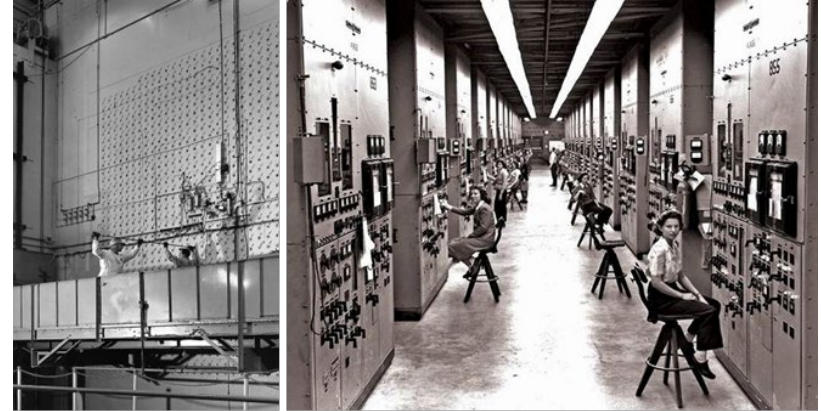


It has been estimated that approximately half a million people worked for the project at one point or another!



# The Clinton Engineer Works (aka: Site X, Y-12, Oak Ridge)

- In fall 1942 a site in east Tennessee was acquired for a uranium enrichment complex
- The 59,000 acre reservation was purchased in September and construction began in early 1943
- In addition to enriching uranium, small amounts of plutonium were also produced at Oak Ridge
- In the summer of 1943 Manhattan District headquarters moved from Washington to Oak Ridge
- The uranium used in *Little Boy* was enriched at Oak Ridge

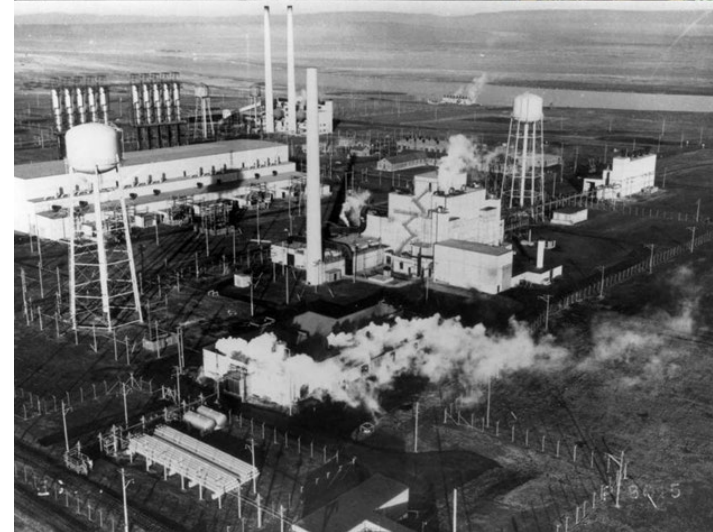
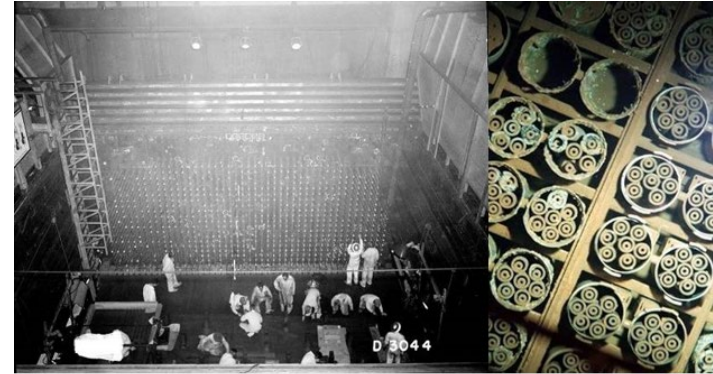






# The Hanford Engineer Works (aka: Site W)

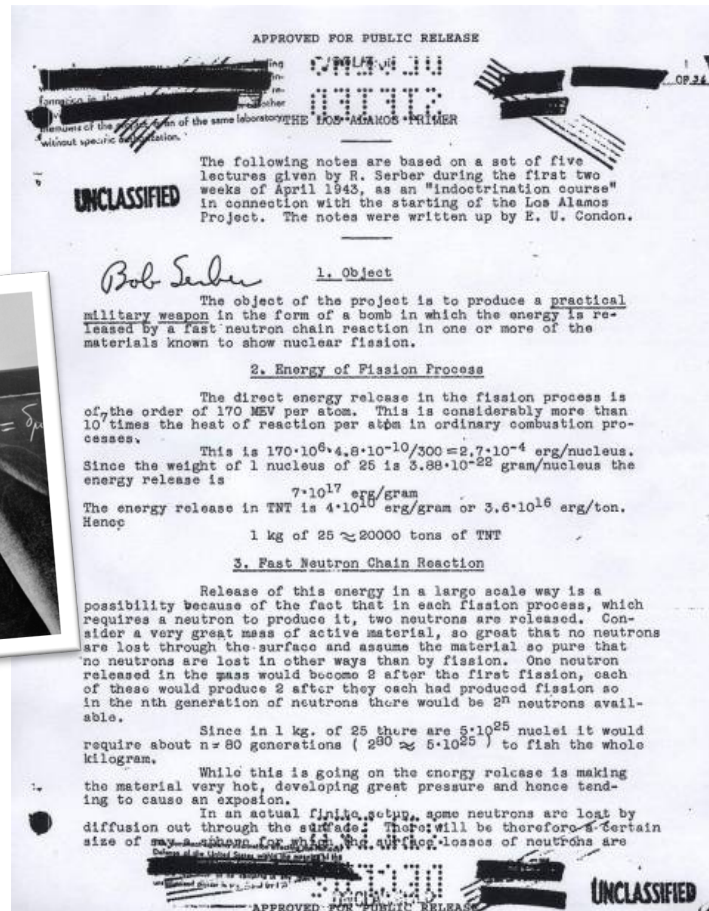
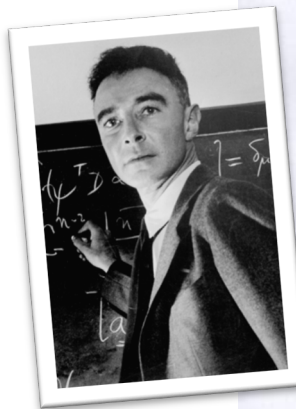
- In late 1942 the Hanford Site in Washington was selected for the plutonium production facility
- Hanford was isolated, sparsely populated and had access to abundant hydroelectric power
- The Columbia River provided the necessary 25,000+ gallons of water per-minute to cool the reactors
- Hanford's three DuPont-built reactors were based on a design by Enrico Fermi
- Plutonium for the Trinity device and *Fat Man* was produced at Hanford



# Project Y: Los Alamos (aka: Site Y, The Hill, The Zia Project, Shangri-La)



- General Groves selected J. Robert Oppenheimer as director of the project's weapons design laboratory
- Oppenheimer suggested Los Alamos as a site for the lab
- The first technical conference was held in April 1943
- Los Alamos was tasked with designing, building, testing and helping deliver the weapons
- The Manhattan Project employed ~129,000 workers at its peak with the Los Alamos technical staff comprising between 1% and 2% of the work force







# The Race for the Atomic Bomb(?)

- There was very little information available on Axis research
- The Germans and the Japanese each had atomic bomb projects, but they only made limited progress
- On December 2, 1942 Enrico Fermi's team at the University of Chicago initiated the world's first controlled nuclear chain reaction



I just thought, well, this is just another one of Fermi's experiments and it worked - I had no reason to doubt that it wasn't going to work and I just went back to work.

Harold M. Agnew



# Wartime Intelligence Activities



- During the war the Laboratory provided technical support in assessing the German nuclear weapons program
- The primary players at Los Alamos included “Deak” Parsons and future Nobel Laureate Luis Alvarez
- Parsons investigated the possibility of a German dirty bomb
- Alvarez estimated the minimum requirements for a German equivalent to Project Y

Subject: Possible Use of Radioactive Poison in Rocket Propelled, Unmanned Aircraft.

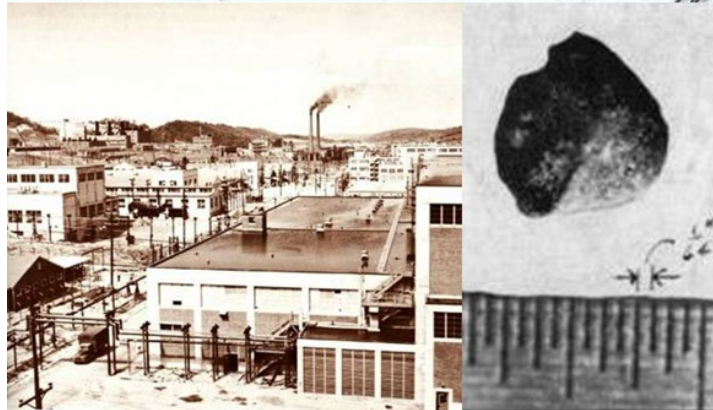
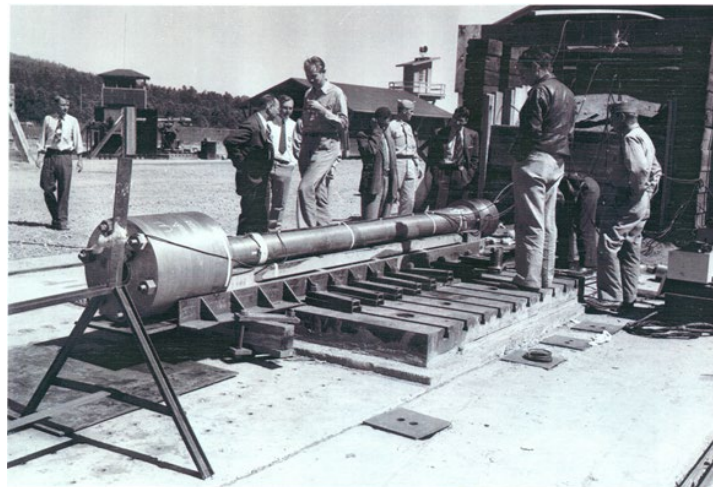




# Building the Atomic Bombs



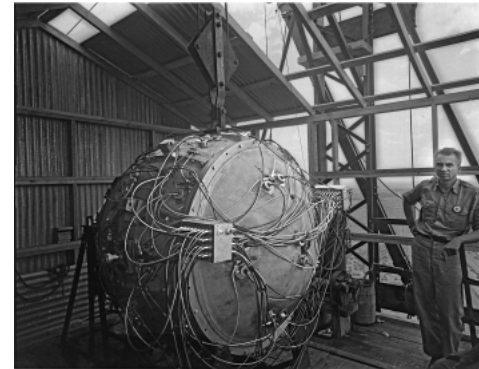
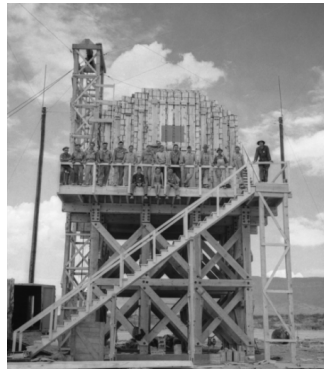
- Initially, scientists believed both plutonium and uranium would work in gun-assembled devices (e.g., *Thin Man* and *Little Boy*)
- A gun assembly fires one subcritical piece of fissile material at another to initiate the chain reaction
- Experiments conducted at Los Alamos in the spring of 1944 demonstrated plutonium was not suitable for a gun assembly
- To salvage the plutonium production effort, a new type of assembly was pursued: implosion
- An implosion assembly compresses a core of plutonium with high explosives to initiate the chain reaction





# Trinity: History's Greatest Science Experiment(?)

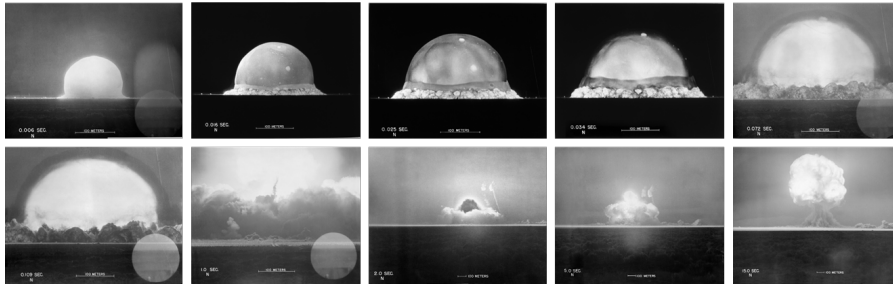
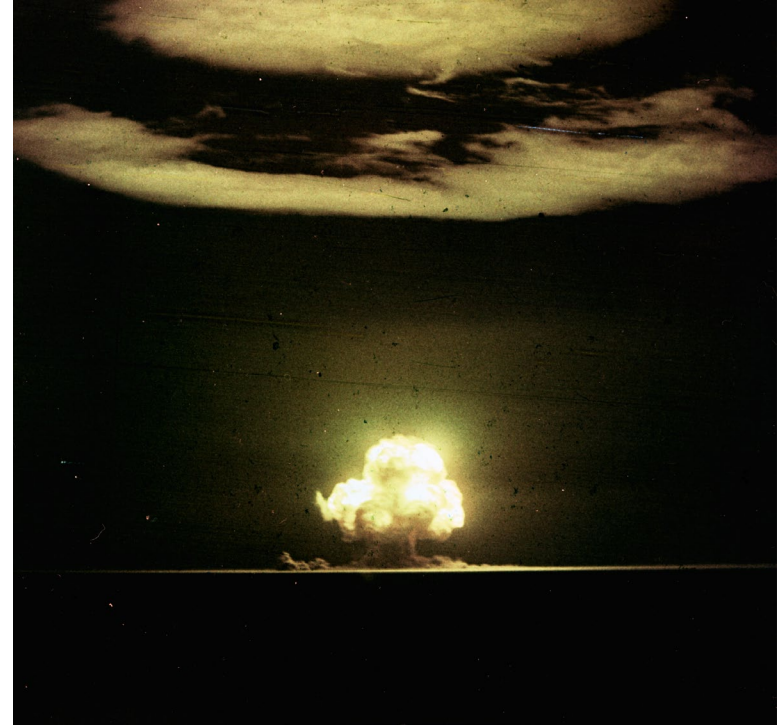
- Scientists were nearly certain the gun-assembled uranium weapon would work
- However, they decided it was necessary to test the more complicated implosion-assembled plutonium device
- The Manhattan Engineer District secured an area within the Alamogordo Bombing Range to test the bomb
- On May 7, 1945 approximately one hundred tons of TNT was detonated in order to calibrate diagnostic instruments for the full-scale test to come
- Approximately 9 hours before the test, Nazi Germany formally surrendered





# "Let there be light..."

- The world's first man-made nuclear explosion was successfully detonated at ~5:29:15 AM on July 16, 1945
- It achieved an official yield of 21 kilotons (21,000 tons of TNT)



Los Alamos National Laboratory photo  
taken by Jack Aeby



LOS ALAMOS  
PROJECT  
MAIN GATE  
PASSES MUST BE  
PRESENTED TO  
GUARDS

# Oppenheimer Remembers Trinity

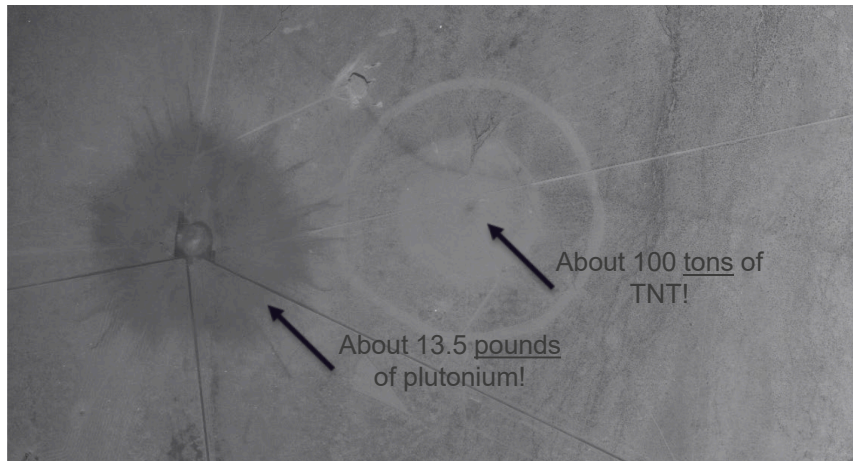






# The Aftermath

- The blast vaporized most of the device's 100' steel tower
- The heat produced by the explosion melted the sand, forming a glass-like material dubbed "Trinitite"





# Target Selection

- The initial goal of the Manhattan Project had been to beat Hitler to the atomic bomb
- After Nazi Germany's collapse, the goal of the project was to provide policymakers with a new option
- A committee to select appropriate targets first met April 27, 1945
- Potential target cities included:
  - Hiroshima, Tokyo, Yokohama, Nagoya, Kobe, Kyoto, Kokura, Nagasaki, Kawasaki, Kure, Yawata, Yamaguchi, Kumamoto, Sasebo
- The Army Air Corps agreed to reserve Kyoto, Hiroshima, Yokohama, Kokura and Niigata



1. The second meeting of the Target Committee convened at 9:00 AM 10 May in Dr. Oppenheimer's office at Site Y with the following present:

DECLASSIFIED  
E.O. 11652, Sec. 1.5  
NND 730039  
By ERG  
NARS, Date 6-4-11

General Farrell  
Colonel Seeman  
Captain Parsons  
Major Berry  
Dr. Stearns  
Dr. Tolman  
Dr. Oppenheimer

Dr. C. Lauritsen  
Dr. Ramsey  
Dr. Dennison  
Dr. Von Neumann  
Dr. Wilson  
Dr. Penney

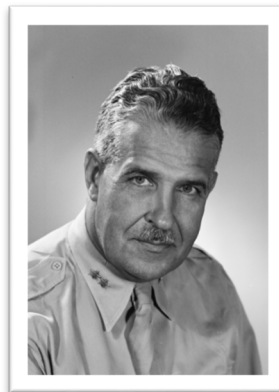


# Shock and Awe



- Japan never had a chance to win the war militarily
- The atomic bombings were intended to help break the Japanese Government's will to resist
- Many years later, General Groves wrote in his memoir:

Admiral Purnell and I had often discussed the importance of having the second blow follow the first one quickly, so that the Japanese would not have time to recover their balance.



## 7. Psychological Factors in Target Selection

A. It was agreed that psychological factors in the target selection were of great importance. Two aspects of this are (1) obtaining the greatest psychological effect against Japan and (2) making the initial use sufficiently spectacular for the importance of the weapon to be internationally recognized when publicity on it is released.

B. In this respect, Kyoto has the advantage of the people being more highly intelligent and hence better able to appreciate the significance of the weapon. Hiroshima has the advantage of being such a size and with possible focusing from nearby mountains that a large fraction of the city may be destroyed. The Emperor's palace in Tokyo has a greater fame than any other target but is of least strategic value.



THOUSANDS OF THESE LEAFLETS WERE DROPPED FROM B-29'S OVER JAPAN TO WARN THAT HIROSHIMA AND OTHER CITIES MIGHT BE BOMBED TO TOTAL DESTRUCTION.

1M-4: PUB76-156-001



# The First Strike

- Hiroshima, a large industrial city with an important army depot, was selected as the target: there were **30,769** army soldiers in the city when it was bombed
- The gun-assembled uranium weapon, nicknamed *Little Boy*, was used
- Colonel Paul Tibbets (standing, second from right) commanded the mission
- He named his plane *Enola Gay*, after his mother







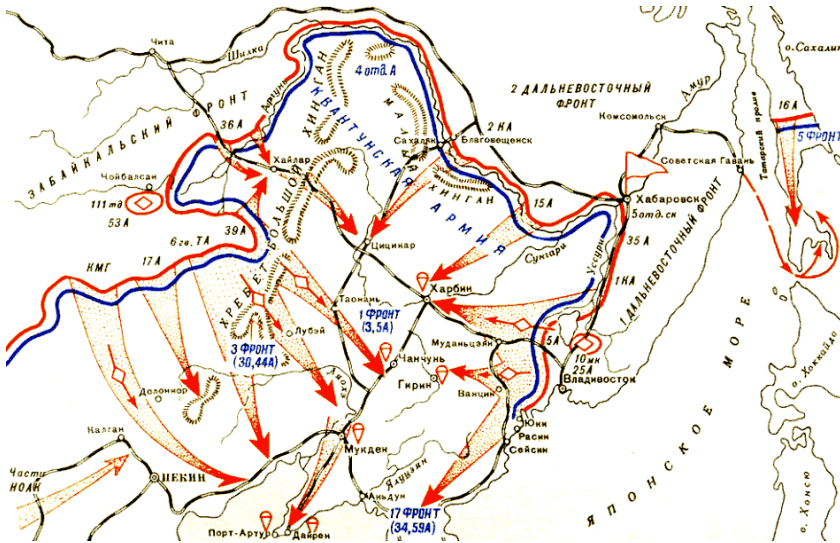
# Hiroshima



- On the morning of August 6, 1945 *Little Boy* was dropped on Hiroshima
- The bomb achieved an official yield of 15 kilotons
- 64,500 died by mid-November 1945 according to the 1954 US Army Pathological Study
- Thousands of Koreans and at least ten American POWs died in the attack
- The strike completely destroyed five square miles of the city



# Stalin Moves East



Now that the Soviet Union has entered the war against us, to continue the war under the present internal and external conditions would be only to increase needlessly the ravages of war finally to the point of endangering the very foundation of the Empire's existence.

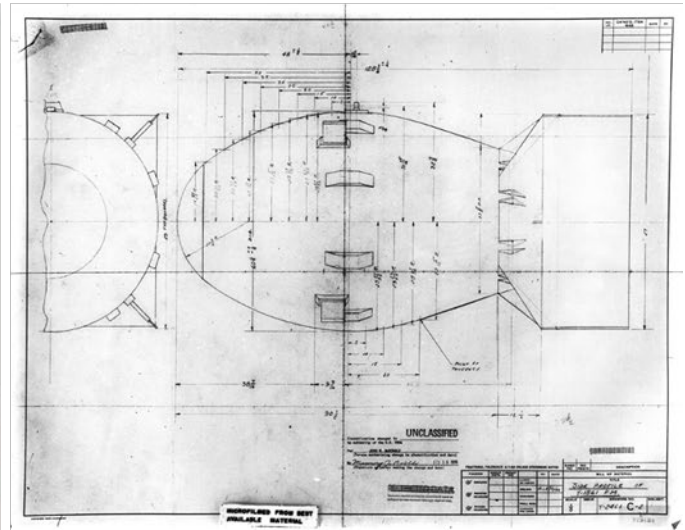
Hirohito, Shōwa Emperor

- Late in the evening of August 8 the Soviet Union declared war on Japan
- The Red Army invaded Manchuria just after midnight
- The invasion was a military catastrophe for the Japanese...
- *...and a diplomatic disaster as well because they had been trying to negotiate with the Allies through the Soviet Union!*
- Nearly 84,000 Japanese soldiers died in the campaign, which lasted approximately four weeks



# The Second Strike

- Kokura, home to one of the largest arsenals in Japan, was selected as the primary target for the second mission
- Nagasaki was once again selected as the secondary target
- The implosion-assembled plutonium bomb, *Fat Man*, was used
- The mission was flown by Major Charles Sweeny in the B-29 *Bock's Car*







# Nagasaki

- Equipment problems, deteriorating weather conditions and a delayed rendezvous between *Bock's Car* and her accompanying aircraft plagued the mission, which was carried-out on the morning of August 9
- After three runs over Kokura, enough fuel remained for one run over Nagasaki
- The attack was successful: the bomb achieved an official yield of 21 kilotons, completely destroying three square miles of the city
- 39,214 died by mid-November 1945
- Thousands of Koreans and hundreds of Chinese died in the attack





- Hirohito was retained by the Allies and used to promote a peaceful surrender
- On August 11 Secretary of State Byrnes sent a telegram to the Japanese via Switzerland:

From the moment of surrender the authority of the Emperor and the Japanese Government to rule the state shall be subject to the Supreme Commander of the Allied Powers who will take such steps as he deems proper to effectuate the surrender terms...

The ultimate form of government of Japan shall, in accordance with the Potsdam Declaration, be established by the freely expressed will of the Japanese people.



# The Japanese Surrender

- On August 14 an armistice was declared
- **That outcome was the joint product of many largely unquantifiable variables**
- The war officially ended on September 2 when Japan formally surrendered aboard the USS *Missouri* in Tokyo Bay
- The surrender was unconditional



From the Imperial Rescript of August 14, 1945

Despite the best that has been done by everyone—the gallant fighting of military and naval forces, the diligence and assiduity of Our servants of the State and the devoted service of Our one hundred million people, the war situation has developed not necessarily to Japan's advantage, while the general trends of the world have all turned against her interest. Moreover, the enemy has begun to employ a new and most cruel bomb, the power of which to do damage is indeed incalculable, taking the toll of many innocent lives. Should We continue to fight, it would not only result in an ultimate collapse and obliteration of the Japanese nation, but also it would lead to the total extinction of human civilization. Such being the case, how are We to save the millions of Our subjects; or to atone Ourselves before the hallowed spirits of Our Imperial Ancestors? This is the reason why We have ordered the acceptance of the provisions of the Joint Declaration of the Powers.

Hirohito, Shōwa Emperor





# The Tragedy of Statistics

American Fatalities:	418,500 (over 300 died each day)	
Soviet Fatalities:	As many as 27,000,000 ( <b>15-20K/day</b> )	
American Pearl Harbor Fatalities:	2,402	
Stalingrad <i>Casualties</i> :	~2,000,000	A single death is a tragedy, a million deaths is a statistic.
American D-Day Fatalities:	2,499	Joseph Stalin
Operation Meetinghouse (Tokyo) Fatalities:	~100,000	
Hiroshima Fatalities:	64,500 (mid-November 1945)	
Nagasaki Fatalities:	39,214 (mid-November 1945)	
Jewish Holocaust Fatalities:	5,900,000+	
Chinese Fatalities	As many as 20,000,000	

## WORLD WAR II CLAIMED BETWEEN 60 AND 80 MILLION LIVES



- On October 16, 1945 Los Alamos received the Army-Navy “E” Award for its contributions to the war effort
- Oppenheimer proudly accepted the award, but also discussed the perils of the new atomic age



It is with appreciation and gratefulness that I accept from you this scroll for the Los Alamos Laboratory, and for the men and women whose work and whose hearts have made it. It is our hope that in years to come we may look at the scroll and all that it signifies, with pride.

Today that pride must be tempered by a profound concern. If atomic bombs are to be added as new weapons to the arsenals of a warring world, or to the arsenals of the nations preparing for war, then the time will come when mankind will curse the names of Los Alamos and Hiroshima.

The people of this world must unite or they will perish. This war that has ravaged so much of the earth, has written these words. The atomic bomb has spelled them out for all men to understand. Other men have spoken them in other times, and of other wars, of other weapons. They have not prevailed. There are some misled by a false sense of human history, who hold that they will not prevail today. It is not for us to believe that. By our minds we are committed, committed to a world united, before a common peril, in law and in humanity.

J. Robert Oppenheimer

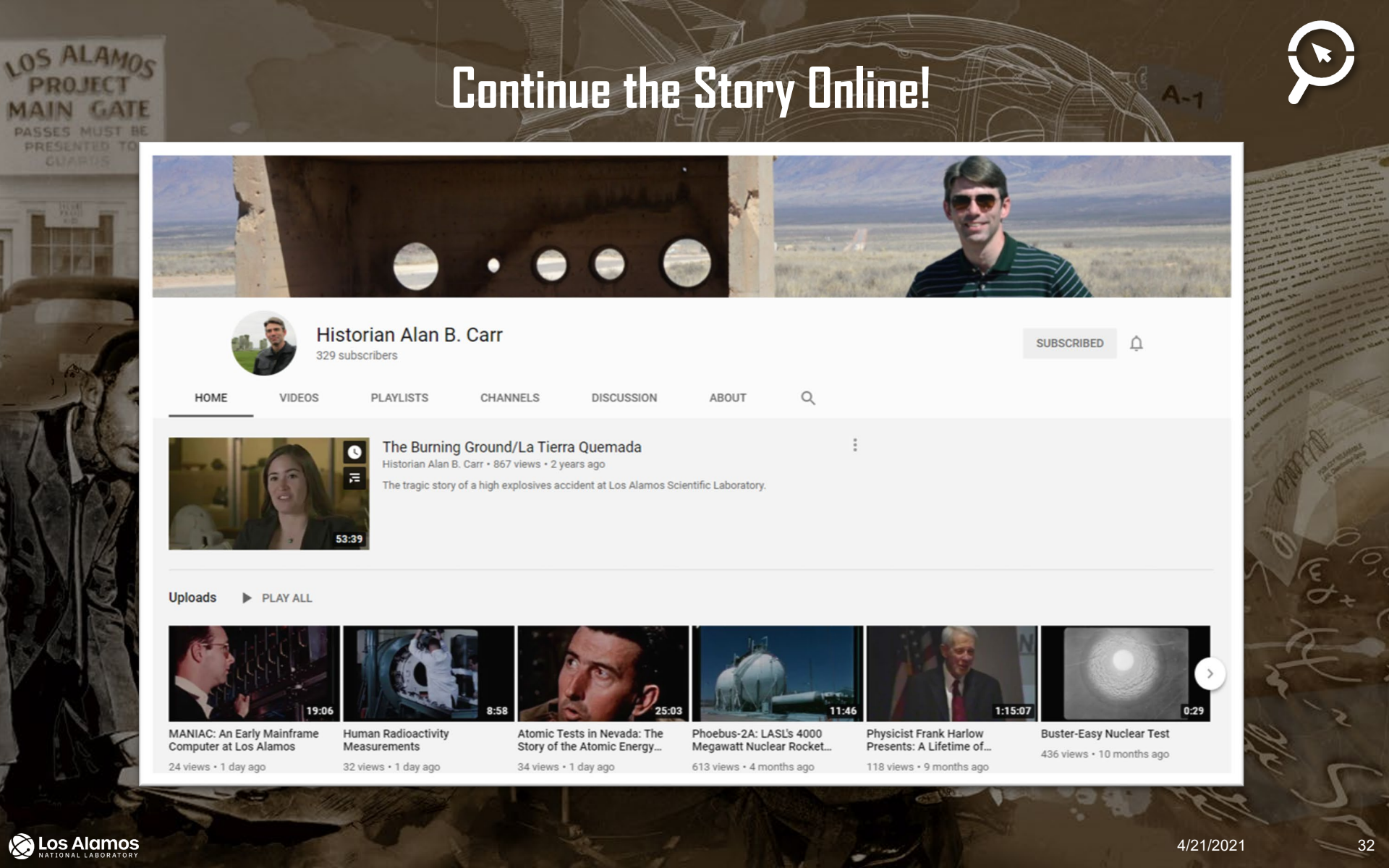
# Oppenheimer's Successor Looks to the Future



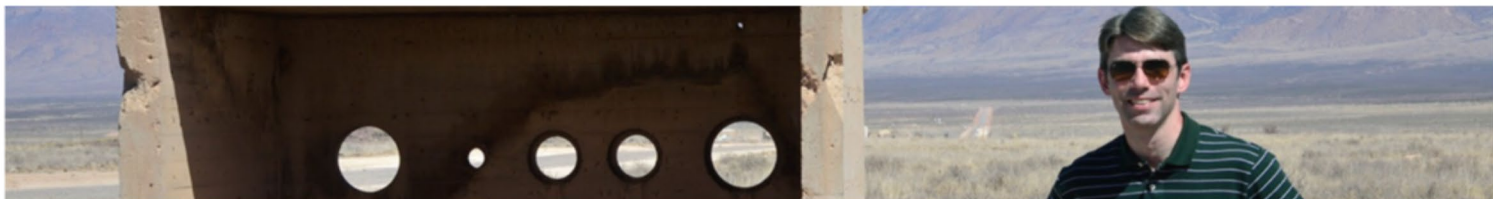
In contrast with almost every other field of human endeavor...the atomic bomb business seeks to put itself out of business. Our one objective at Los Alamos has always been that bombs never get used; that the United States was always ahead both in technology and a willingness to discuss the abandonment of nuclear warfare.

Norris E. Bradbury  
LASL Director, 1945-1970





# Continue the Story Online!



**Historian Alan B. Carr**  
329 subscribers

SUBSCRIBED

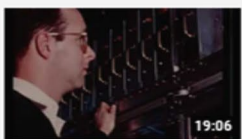


- HOME
- VIDEOS
- PLAYLISTS
- CHANNELS
- DISCUSSION
- ABOUT
- Q



**The Burning Ground/La Tierra Quemada**  
Historian Alan B. Carr • 867 views • 2 years ago  
The tragic story of a high explosives accident at Los Alamos Scientific Laboratory.

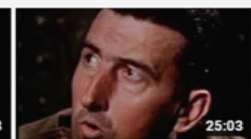
Uploads ▶ PLAY ALL



**MANIAC: An Early Mainframe Computer at Los Alamos**  
24 views • 1 day ago



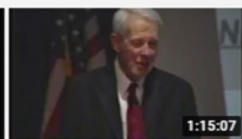
**Human Radioactivity Measurements**  
32 views • 1 day ago



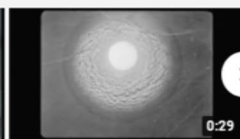
**Atomic Tests in Nevada: The Story of the Atomic Energy...**  
34 views • 1 day ago



**Phoebus-2A: LASL's 4000 Megawatt Nuclear Rocket...**  
613 views • 4 months ago



**Physicist Frank Harlow Presents: A Lifetime of...**  
118 views • 9 months ago



**Buster-Easy Nuclear Test**  
436 views • 10 months ago